WPS4689

POLICY RESEARCH WORKING PAPER 4689

China and Central and Eastern European Countries: Regional Networks, Global Supply Chain, or International Competitors?

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The World Bank
Development Research Group
Trade Team
August 2008

Policy Research Working Paper 4689

Abstract

China has emerged as one of the top recipients of foreign direct investment in the world. Meanwhile, the successful transition experience of many Central and Eastern European countries has also allowed them to attract an increasing share of global foreign direct investment. In this paper, the authors use a panel data set to investigate whether foreign direct investment flows to these two regions are complements, substitutes, or independent of each other. Taking into account the role of host country characteristics – such as market size, degree of trade liberalization, and human capital – the authors find no evidence that foreign direct investment flows to one region are at the expense of those to the other. Instead, the results suggest that foreign direct investment flows are driven by distinct regional production networks (and thus are largely independent of each other) and the development of global supply chains (indicating that foreign direct investment flows are complementary).

This paper—a product of the Trade Team, Development Research Group—is part of a larger effort in the group to understand foreign direct investment inflows in transition economies. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at fng@worldbank.org.

China and Central and Eastern European Countries: Regional Networks, Global Supply Chain, or International Competitors?

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JEL classification numbers: F20, F21, F43

Keywords: Foreign Direct Investment (FDI), Regional Networks, Global Supply Chain, China's FDI, Central and Eastern European Countries' FDI

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1. Introduction

The past two decades have seen significant expansion in foreign direct investment (FDI) in China. Starting from a modest base of US$3.49 billion in 1990, China's FDI inflows expanded rapidly to peak at over $44.2 billion in 1998. A further surge in FDI accompanied China's accession to the World Trade Organization (WTO) in December 2001, promoting China to a top position as an FDI destination in 2003. In 2005, FDI inflows reached a record high of over $70 billion.

Governments from other emerging markets are very concerned about this unprecedented growth. As they would point out, world FDI in the same period grows only at a moderate rate and this could imply that a rapid growth in FDI attraction like the one in China will eventually hollow out FDI shares to other emerging markets, which is often referred to in the literature as the China effect. Researchers as well as policymakers from many countries at various occasions expressed their concern over this issue[1] and it is clear that an empirical analysis with some convincing results is both urgent and necessary.

So far, the existing literature is mainly focused on studying China and other Asian and Latin American countries while less attention has been paid to regions such as the Central and Eastern Europe. From history, the European Union (EU) has always been the largest source of FDI inflows to the Central and Eastern European countries (CEECs). When most CEECs opened their door to western direct investment after the transition in the early 1990's, the more advanced economies in the region (the Czech Republic, Hungary, and Poland) were well-positioned to attract large flows of FDI. Their main

[1] Chantasasawat et al. (2004) and Eichengreen and Tong (2005) cite several comments by politicians and scholars from emerging markets on the threat to FDI inflows posed by China.

advantages in this regard include close geographical and cultural ties with traditional EU members as well as their initially low wage levels. Meanwhile, as remarkable economic achievement in East and Southeast Asia in the 1980s and 1990s caught the attention of the rest of the world (including the EU), an increasing share of world FDI started to flow into the region beginning 1996. China, as the region's major successful performer in economic growth, becomes one of the most important host markets for European Union FDI. The dramatic increase of FDI in both regions arouses much concern over whether there exists an overall substitution or complementary effect on FDI attraction between the two regions. In particular, one may wonder if China's emergence as a top FDI recipient tends to crowd out FDI inflows to CEECs. Since both China and CEECs have benefited a great deal from FDI inflows over the last two decades, such issue is of apparent interest to academic scholars and policymakers from both regions.

We take the starting point of our study from one major insight from the existing literature of FDI in alternative emerging market economies, viz. such FDI is often motivated by investment to facilitate production networks. We conceptualize our approach by considering three alternative scenarios that may exist between FDI in China and in CEECs. The first possibility is that China itself is only in the Asian *regional* production network, with FDI go there being unrelated to FDI in CEECs. A second possibility is that China and CEEC economies are together in a *global* production network, so that FDI to China and FDI to CEECs are complements. Lastly, we can think of multinationals considering China and CEECs as *rival* production sites, implying that FDI flowing to China and to CEECs are substitutes.

The aim of this paper is to investigate our proxy for the impact of China together with other FDI locational determinants within an analytical framework. With a panel data of 15 CEECs spanning the period from 1990 to 2004, this empirical study tries to shed some light on the relationship between the two regions in terms of FDI attraction and further economic cooperation in a broader scope. The paper is organized as follows. Section 2 introduces a background review on FDI development in the two regions. Section 3 describes our data and estimation methodology. Section 4 presents the estimation results. Some robustness checks are discussed in section 5. Section 6 concludes.

2. FDI in China and Central and Eastern Europe since 1990

China has, after its first adoption of open the door policy in 1978, experienced several phases in inward FDI absorption from the rest of the world (Figure 1). In the first stage, from 1979 to mid 1980's, only a small amount of FDI flowed to the country annually due to its insufficient infrastructure and nontransparent regulations. Subsequently, FDI inflows to the country rose at a fairly steady pace until it made a slump in 1990 as a result of economic sanctions for political reasons. It was not until 1992, the year in which the then Chinese leader Deng Xiaoping toured Shanghai and Guangdong with further commitment to open the market that the value of annual FDI inflows jumped up again to a new high of $11.2 billion. This wave of rapid surge continued through the following years until it slowed again as a result of the Asian financial crisis in 1997. China regained its attraction for FDI since 2000. Its accession to the WTO in 2001 induced a new surge of FDI inflows to the country. Despite a

worldwide decline in FDI outflows, China continued its expansion in terms of its global FDI shares and overtook the United States to become the world's second largest destination of FDI in the early 2000's. Among the economies investing in China, a majority comes from industrialized or newly industrialized countries. Until the mid-1990's, Hong Kong was the largest source, accounting for more than 50 percent of the nation's total FDI, followed by Taiwan, the U.S., Japan, Singapore, the U.K., South Korea, Canada and Germany. In recent years, there is decline in shares of FDI coming from Hong Kong and a rise in shares from other regions, contributing to a more diversified pool of FDI in China. Meanwhile, accompanying the double digit growth of the nation's inward FDI are some prominent changes in its mode. In early period, FDI was allowed only in a small number of industries largely due to the government's cautiousness against a dominance of foreign capital in many industries. Later on, especially after Deng's southern tour in 1992, many more industries became open to foreign investors. With more foreign capital entering the industries such as manufacturing, retailing, real estate, transportation, and banking, FDI in China started to shift from labor- and capital-intensive to mainly technology based manufacturing with an increasing share towards service sectors (Figure 2).

Similarly, FDI inflows to the Central and Eastern European Countries (CEECs) show a steady growth pattern over the last two decades. Beginning in 1989, all CEECs started the transition from former communist's central planning economy to a free market economy. In the area of the former Soviet Union, transition started later, and only the dissolution of the Soviet Union in 1991 allowed a significant change in the policy. Even then, the first few years of transition in the former Soviet Union (FSU) countries were

hampered by the challenges related to nation-building. Most FSU countries, with the notable exception of the three Baltic States, are still behind the CEECs in implementing reforms.

As a result of this profound political and structural change, annual FDI flows in the region, of which a majority originated from EU, began to rise quickly from a low level. However, drastic economic and political reforms promoted in the CEECs at the beginning of the transition caused almost all members to suffer an economic recession to various degrees. Consequently, FDI inflows in the same period were adversely affected. Starting 1994, regional FDI picked up largely due to a successful transition in many of the CEECs. The almost doubled annual FDI inflows during this period from $12.3 billion in 1995 to $23.5 billion in 2000 were mainly induced by large-scale of privatization in the more advanced CEECs. For example, the purchase of a majority share in Poland's Telekomunikacja Polska by France Telecom for $4 billion in 2000 was one of the largest privatization and FDI transactions in the region. The European Bank for Restructuring and Development (EBRD) compiles annually indicators depicting the progress in structural reforms related to the transition to market economy. EBRD (2007) shows the progress in both large-scale and small-scale privatization in our sample countries between 1990 and 2004. In Figure 3, we show the extent of privatization using an index, with a value of 4.0 denoting the level of reform comparable to a fully functioning market economy and a 1.0 being a completely unreformed economy. According to this Figure, we can see that many countries in the Central and Eastern Europe had completed the large-scale privatization by mid-1990s, while in a few countries the process was still

incomplete in mid-2000s. However, it seems apparent that the countries which moved faster in privatization were also able to attract more FDI flows.

With most privatization processes in the region's advanced economies coming near a completion, the mode of FDI inflows in CEECs was expected to shift from privatization towards more technology-intensive greenfield projects and large cross-border mergers & acquisitions. In addition, this wave of FDI also encouraged less developed southeastern European countries to further their structural and institutional reform, accelerating the liberalization and privatization of state-owned enterprises, cutting corporate tax rates and introducing tax exemptions and other incentives to foreign investors. One thing to note is that behind this fast increment of FDI in the region, there still exists a high degree of variance in FDI distribution with disproportionately large shares flowing into more advanced states (Hungary, Czech Republic, Poland and Slovakia). Moreover, the sectoral distribution of FDI may differ between the CEECs and China, as well as between the CEECs themselves. For example, EBRD (1998) notes that already in 1997 some 40-60 per cent of the FDI stock in the CEECs was in the manufacturing sector, but the importance of services was increasing rapidly, especially in the more advanced countries.

During the last 15 years, the EU continued to increase its trade and FDI with China. In 1999, EU-originated FDI accounted for 11 percent of China's total FDI absorption, making it the second largest source next to Hong Kong. Meanwhile, due to the geographical and cultural proximity between CEECs and the EU, the latter accounted for more than 79 percent of CEECs' FDI inflows in the past 15 years. Thus, both China and CEECs consider the EU as their major sources of FDI inflows. The similarity between CEECs and China is also clear. They were both running a central planning economy

under communism before the transition. Most of the foreign trade was accomplished within the socialist block. Starting as early as 1989, they began the transition from central planning to market economy. However, there is still much difference as to the exact trajectory they followed during the reform. While many CEECs adopted a comprehensive economic and political restructuring with precipitate privatization process, China was more prone to focusing on economic reforms alone. This discrepancy, together with other factors such as different host country's comparative advantages contributes to the variation in FDI characteristics and trade pattern between the two regions. As pointed out in Sachwald (2004), when comparing FDI from US, Japan and the EU, they found that most US and Japanese multinational corporations (MNCs) are interested in taking China as the manufacturing platform via vertical channels while their European counterparts more favor a horizontal linkage in its domestic market. Surveys on international investors also indicate that, among the top decisive factors in determining FDI destination, relatively high skilled labor force in line with production needs in CEECs is the most attractive attribute that drives their investment to the region.

Meanwhile, the fifth EU enlargement[2] with accession to the Central and Eastern European countries brings the opportunity for European investors to extend their operations in new member states. With access to a larger market and free movement of capital and labor resources across member states, foreign investors are more inclined to participate in local economy for reason of comparative advantages. Early literature has empirically testified the positive impact of increased integration in the European Union. Norman (1995) showed that the process of regional integration in the EU resulted in a

[2] The European Union has undergone five enlargements with the largest occurring on May 1, 2004, when 8 out of 10 new members are CEECs, including Czech Rep, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

rapid growth in intra-EU FDI, contributing to the increase in intra-EU FDI from 25 percent of total inward stock in 1980 to 40 percent in 1988. Parallel to those studies which focus on the benefits FDI brings to the host market, recent literature takes the other direction by tackling the possible crowding out effect of FDI as a result of the fifth EU enlargement. Particularly, they are worried that too much FDI redistribution from old members in the west to new ones in the east could mean a substitution for those traditional FDI destinations, thus hurting their economy. Barry and Hannan (2001) and Barry (2002) compare Ireland with new members among CEECs and conclude that the similarity between the two when joining the European Union (relatively low economic development level and cheap labor costs compared to other member states) can lead the latter to follow a similar development trajectory. In terms of FDI substitution, the authors propose two possible directions, both of which have found supporting evidence. On one hand, the fifth enlargement contributes to an increase in total FDI in both old and new member states. On the other hand, benefiting from technology spillovers and structural improvement due to FDI, CEECs are now in a better position competing with other old member states, causing a potential diversion of FDI flows. Indeed, similar patterns can be expected in other parts of the world as well.

Given both China and CEECs' enlarging shares of world FDI and the similarity as well as difference in their economic and institutional reform, one may wonder whether FDI inflows to the two regions have any correlation in between, and if so, is it of complementary or competitive nature? It is believed that a clear understanding of the exact relationship between the two is not only beneficial to both economists and politicians for research and policy making purpose, but also crucial in the understanding

of the current wave of globalization. However, up until recently, there is still insufficient amount of research that focuses on the comparison between China and the Central and Eastern Europe as favorable locations for global FDI. Empirical works that tend to quantify the magnitude of the potential impact between the two are even fewer. In this regard, our paper aims to provide an empirical analysis of the above issues. In particular, we want to show whether China's continuing economic expansion, by appealing to foreign investors with the nation's comparative advantage in labors costs and large market, diverts global FDI from CEECs, the so-called hollowing out effect. Alternatively China and CEECs may belong to distinctly different regional production networks and the correlation between their respective FDI inflows is zero. A third possibility is that both China and the CEECs both share a global supply network, leading to the possibility that FDI going to China and FDI going to the CEECs being complementary.

3. Data and methodology

Given the purpose of empirically investigating the correlation between China and Central and Eastern European countries in attracting foreign direct investment from the world, a model is constructed by regressing host country's FDI inflows on the China effect variable, China FDI inflows in our model, while controlling for a set of host characteristics. Therefore, a statistically significant estimate on the China effect variable would be considered proof of a strong such correlation. The data used in the model are a panel spanning the period from 1990 to 2004 for 15 CEECs. They are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia FYR, Poland, Romania, Serbia and Montenegro, Slovakia and

Slovenia. Thus, the number of observations in the panel is 225 (15×15). We focus on the period starting in 1990 because we believe such selection fully covers the transition period and thus helps us gain a thorough understanding by incorporating the time trend and growth pattern of FDI inflows in the region.

With all variables converted to log form except those presented in percentages[3], our benchmark regression appears as follows:

$$\begin{aligned}\ln FDI_{i,t} &= b_0 + b_1 \ln CFDI_t + b_2 \ln FDI_{i,t-1} + b_3 GPCGR_{i,t} + b_4 \ln GDP_{i,t} + b_5 \ln WFDI_t + b_6 \ln WAGE_{i,t} \\ &+ b_7 ILLIT_{i,t} + b_8 OPEN_{i,t} + b_9 TARIFF_{i,t} + b_{10} INCTAX_{i,t} + b_{11} PSR_{i,t} + b_{12} \ln TELE_{i,t} + b_{13} ACCESS_i + u_i + v_{i,t}\end{aligned} \quad (1)$$

where subscript "*i*" and "*t*" stand for country *i* in year *t* and u_i denotes the country-specific effects and v_{it} the disturbance term.

Our dependent variable is annual foreign direct investment inflows to the 15 CEECs. As defined in IMF (1993), direct investment refers to "investment that is made to acquire a lasting interest in an enterprise in an economy other than that of the investor, with a purpose of having an effective voice on the management level." Such management control usually requires a minimum of 10 percent ownership of investors for the investment to be classified as direct. Our data for FDI inflows are drawn from UNCTAD interactive database.

The independent variables included in the model are expected to influence individual host country's FDI inflows through both economic channel such as foreign trade and economic growth and environmental one with changes in institution and policy. One thing that interests us most is the use of China's FDI inflows as a proxy for the

China effect. According to Chantasasawat, Fung, Iizaka and Siu (2003), there are two lines of reasoning to support the inclusion of this variable. One major objective of foreign direct investment is to exploit comparative advantage in a host country. In deciding which destination to invest, Multinational Corporations (MNCs) often choose among several comparable candidates the one with the lowest labor costs. Under this scenario, an increase in FDI inflows to the country with lower labor costs must come at the expense of reducing the inflows to others, thus generating a "hollowing out" effect. It is not unusual nowadays to hear worries from various sources that the emergence of China as a top FDI recipient diverts the FDI inflows to other countries. Although it is a major concern, an equally strong and empirically sound argument suggests that rapid growth of FDI inflows to one country, via production network and supply chain linkages, can further stimulate similar growth in its neighboring and other economies. With further integration and cooperation across borders, an increasing portion of the production processes from MNCs now take form of specialization and fragmentation, which necessitate large investment within a set of production network. Member countries, with their respective advantages across distinct stages of production, all benefit from large inflows of foreign investment. Empirical studies in the literature give mixed implications on the correlation between country-wise FDI inflows. As pointed in Cravino, et al (2006), the emergence of China in the global economy has had positive effects on global FDI flows. Lall and Zhou (2005) suggest that China raised rather than diverted FDI flows to its neighboring countries. Eichengreen and Tong (2005) find that growth in China's FDI inflows encourages FDI to other Asian countries but diverts those from OECD recipients.

[3] See detailed data description in Appendix.

In our case, the above two types of effect would imply opposite signs on the proxy variable and it remains to be seen which effect stands dominant.

As mentioned earlier, we can think of this issue by considering three alternative hypotheses: China (together with East Asia) and CEECs being in their respective regional production network, so the estimated coefficient on the China effect is expected to be zero. A second hypothesis is that China and CEECs are in the same global supply chain, we then expect the coefficient on the China variable to be positive. Lastly, China and CEECs can be perceived to be rivals by global multinationals, so the sign on the China effect should be negative.

Our model also controls for a potential agglomeration effect of FDI in transition economies. Various empirical works (Head, Ries and Swenson, 1995) show the existence of an agglomeration effect in most FDI activities. Such effect takes place when investors believe they can benefit from herding within the same location. To them, these benefits include but are not limited to a better supplier network, sufficient skilled labor and enhanced productivity, all of which are crucial for profitable long-term investment. Moreover, accumulation of FDI from investment herding may exert a positive feedback on the superiority of the local investment environment to potential investors of interest and thus lead to more FDI inflows. We use a one-year lagged value of FDI inflows to accommodate the agglomeration effect.

Meanwhile, the host country's macroeconomic conditions are among the top considerations in MNC's location decision. Countries with stable economic growth and above average market size are more likely to have production capacity and large demand and are therefore favored as attractive destination. We consider host country's per capita

real GDP growth and annual real GDP good indicators of its economic growth and market size. Data for real GDP and per capita GDP are drawn from World Bank's World Development Indicators. Real GDP data are measured in constant 2000 US dollars.

It is well substantiated that country-specific institutional and policy factors are important to MNC's investment location preference. Easy access to market, favorable investment regulations as well as domestic political stability are all among the top factors controlling the direction of their investment flow. However, to correctly interpret the findings on the relevant determinants of FDI, one should bear in mind the distinction between two types of FDI identified by their respective motivations. Market-seeking or horizontal FDI, with a focus on the market in host country, chooses local production to avoid the associated costs of trade. It is the type that dominated the FDI flows in the early days and still plays important role in today's global economy. Apart from that is the so called cost-minimizing or vertical FDI where investors pick up different locations for each link of production chain to reduce the overall costs. Hanson, Mataloni and Slaughter (2001) indicate that recent surge of FDI inflows, especially to the South, is mainly of vertical form. Similar conclusion is also found in Markusen and Maskus (1999). Distinction on the type of FDI will have different implications on its location determinants, e.g. market size, trade restrictions. In our analysis, trade restrictions are controlled for by including both import tariff rates and openness to trade. Import tariff rates are collected from IMF Government Finance Statistic Yearbook as well as national statistical agency websites and are measured as percentage of import tariff on total revenue from international trade and transactions. And openness to trade is calculated as the ratio of country's trade turnover to its GDP.

In line with the distinction, labor costs, which are considered another important determinant of investment flows, may exert different impacts as well. It is argued that vertical FDI, by taking advantage of comparatively low production costs in the host country, shall be negatively related to it. In Bedi and Cieslik (2002), evidence shows a strong negative correlation between FDI and wage levels in Poland. In case of horizontal FDI, generally a negative sign would be expected as well because cost considerations, although they may no longer be the top priority in investors' decision making, still play a role. However, this does not exclude the possibility that a positive relationship would show up in some instances. One would expect a positive sign on the wage rate to reflect the purchasing power and labor quality of the local market. To control for this factor, we use the wage rate in manufacturing as a proxy. The International Labor Organization's LABORSTA provides the data for individual country manufacturing wages in local currency. We convert the wage rates to US dollars using official average exchange rates drawn from World Development Indicators. As for labor quality, we include the illiteracy rate among the host population as the proxy. The illiteracy rate data are from United Nations Education, Scientific and Cultural Organization (UNESCO)'s Institute for Statistics and are calculated as the percentage of people aged 15 and above who are illiterate.

In terms of institutional variables, it is widely accepted that the host country's political as well as financial risks are critical to its overall economic well-being. This is more so in our case because almost all CEECs have experienced political instability and economic slump at the beginning of the transition. As pointed out in Navaretti and Venables (2004), "political risk and instability seems to be an important deterrent to

inward FDI". Henisz (2000) demonstrates that political and contractual hazards may go hand in hand since transactions that originally should have been effectively organized through contractual agreements are more likely to appeal to arbitration or courts. Equally detrimental to inward FDI growth are the financial instability, corruption and social disorder of the host country. Corruption is believed to induce uncertainty in the business environment and discourages FDI inflows. Lack of legality indicates weak protection in case of need and therefore further aggravates the investment environment. We adopt the International Country Risk Guide (ICRG) group index of political stability risk (PSR) as a proxy for the institutional and political quality of the host country. The index incorporates 12 risk categories (bureaucratic quality, corruption, democratic accountability, ethnic tensions, external conflict, governmental stability, internal conflict, investment profile, law and order, military in politics, religious tension, and socioeconomic conditions) and is calculated as a weighted sum out of 100 (a higher score corresponds to less risk and stronger stability).

Tax burden is another factor that concerns potential foreign investors when choosing a location for FDI. As one would expect, a high income tax rate for business could imply a narrower profit margin, which may deter FDI. It is supported in Wei (2000) that a significant negative relationship exists between the corporate income tax rate and FDI attraction. Also argued in the literature is the host country's infrastructure quality. According to the survey from World Investment Directory (2003), large FDI projects are partially driven by the infrastructural quality of the host economy. World Economic Forum's Chief Economist, Augusto Lopez-Claros (2005), has stated "an inadequate supply of infrastructure is rated by business as the biggest obstacle to operation in foreign

affiliates and improving basic infrastructure would drive up FDI". Fung, Iizaka and Parker (2002) and Fung, Iizaka and Siu (2003) find positive evidence that Chinese provinces with better infrastructure are more likely to become an FDI destination. Our data for the corporate income tax rate are collected from various issues of Price Waterhouse Cooper's Worldwide Tax Summaries and European Tax Handbook. The proxy for the host country's infrastructure quality is the number of telephone mainlines per thousand people collected from World Development Indicators.

Factors that control for every host country's FDI recipients include the current global supply characterized by world FDI outflows. Other things equal, a jump in FDI outflows worldwide is expected to have a positive effect on FDI inflows to all host countries. Therefore, annual world FDI outflow is added in our analysis to take care of this supply side effect. Data for world FDI outflows are drawn from the UNTCAD interactive database. (See summary table of data descriptions and sources in Appendix.)

In addition, the fifth EU enlargement, by granting accession to eight CEECs, is likely to signal to foreign investors the credibility of these countries' institutional and economic reforms. In recognition of their strong improvement, foreign investors are more confident choosing to operate their business in these economies. Follow the reasoning, a dummy, accession is constructed which assumes the value of 1 for all eight CEECs that are member states and 0 for the remaining seven. Since the dummy, accession is time invariant, estimation from either the fixed-effect model or first-differencing in the Generalized Method of Moments (GMM) will drop it out of the regression. In order to recover the estimates for accession, we transform by interacting it with a time trend[4].

[4] The accession dummy is assigned as country-specific and time fixed across the period.

Given the panel structure of our data, a host of methods are available for estimation. One common issue that arises in the estimation of panel data is whether the individual effects are considered as “fixed” or “random”. For comparison, we estimate and report both fixed and random effects with Generalized Least Squares method. Another problem with our analysis is the potential endogeneity of the lagged value of FDI inflows and the proxy variable for the China effect, China FDI inflows. One can argue that neither variable are strictly exogenous to the dependent variable, FDI inflows to CEECs. Some omitted factors can simultaneously affect both variables, making them endogenous and correlated with the error term (e.g. a worldwide technology shock that increases FDI to China is expected to enhance FDI to CEECs likewise; Eichengreen and Tong (2005) suggest that an improvement in investor sentiment worldwide can be another example of this endogeneity). A solution to this is the use of instrumental variables. In our analysis we adopt the Error Component Two Stage Least Squares (EC2SLS) model of Baitagi (1981, 2001), which is the IV analog of a random-effects model. In the first stage of EC2SLS, the endogenous variable is regressed on all of the exogenous variables in the system, which are modified by the “within” transformation and the “between” transformation, plus any exogenous instruments that we use. In the second stage, outcome variable is regressed on the exogenous variables and the predicted value from first stage in place of the endogenous variable.

Meanwhile, in the context of the endogeneity problem, another estimation method, namely the Generalized Method of Moments (GMM) Instrumental Variable estimator for dynamic panels proposed by Arellano and Bond (1991), can yield consistent estimates

while gaining significant efficiency[5] and therefore is also applied to our model. According to the method, the model to be estimated is as follows:

$$\Delta Y_{it} = \alpha \Delta Y_{i,t-1} + \beta \Delta X_{it} + \Delta u_{it} \qquad (2)$$

where all "Δ"s are the first-differenced term of the corresponding variables in equation (1), e.g. $\Delta Y_{it} = Y_{it} - Y_{i,t-1}$ is the first difference of the dependent variable, FDI inflows to country *i* in year *t*. $\Delta Y_{i,t-1}$ is the one-year lagged value of the new dependent variable, ΔY_{it}. ΔX_{it} is a vector which includes all the explanatory variables from equation (1).

The model can be estimated in one stage or in two stages GMM. The two-stage method involves using the residuals from first stage to compute an optimal weighting matrix, which is subsequently applied to the second stage. In the following, we present only the one-stage estimates, from which robust standard errors can be constructed. In addition, Arellano and Bond (1991) warn against interpretation on coefficients within the two-stage framework, due to a likely underestimation of the standard errors of the coefficients. In fact, we estimated with both methods and the two-stage results were not qualitatively different. To check for the robustness of the model, we also conducted two specification tests. The first is the Arellano and Bond test of second-order correlation in the first-differenced error terms, the SOC test. The second is the Sargan test of over-identification which tests for correlation between the instruments that are excluded from

[5] The efficiency can be improved by using lagged values of both the instrumented variables and the instruments as additional instruments. For detailed GMM estimation, see Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).

the second-stage model and the residuals. Both tests are used to check the validity of the lagged instruments as well as the appropriateness of the model.

4. Empirical results

Tables 2 to 5 present the parameter estimates for determinants of CEECs' FDI inflows using different models: Feasible Generalized Least Squares with fixed effects (FGLS-FE) in Table 2, Feasible Generalized Least Squares with random effects (FGLS-RE) in Table 3[6], Error Correction Two Stage Least Squares (EC2SLS) and Generalized Method of Moments (GMM) in Tables 4 and 5. Column I through VI in each table compares the results for various specifications.

Our results show a positive coefficient on China FDI inflows among all models except those in GMM which keeps negative but insignificant. The coefficient is strongly significant and positive within the fixed-effect framework. This implies that FDI inflows to China and the Central and Eastern European countries are not, as certain scholars and politicians may have worried, strongly competing against each other. Rather, as indicated by the mostly positive estimates, they may even at some point work as complementarities. Consequently, a strong growth in China's inward FDI should not be taken as a menace to CEECs by crowding out the FDI inflows to the region. However, the loose relationship between the two streams of FDI may come as the result of a relatively long distance between the two regions. As indicated in trade theory, geographic distance between two parties weakens bilateral trade as trade costs and other barriers tend to rise. It is possibly true that both geographic distance and cultural difference between

[6] The Hausman test indicates the superiority of the Fixed-effect over Random-effect model though both results are presented.

China and CEECs contribute to their unique attributes as host for FDI and therefore foreign investors in general do not necessarily consider the two markets as competitors.

Another possible explanation for the loose connection lies in the different types of FDI that dominate the two markets. On one hand, as documented in various studies (Navaretti and Venables, 2004), a horizontal type FDI with the main purpose of market-seeking is believed to be prevalent among the transition economies. On the other hand, due to its relative low cost of labor, China is believed to have an ever growing presence of vertical FDI, whose main purpose is to minimize the global production costs across all stages. Their focus on different goals led foreign investors to choose each market accordingly without necessarily placing one as a substitute for the other.

Across all specifications, lagged FDI is strongly significant and positive, indicating a well-founded self-reinforcing effect of the dependent variable's past value on its current value. Since FDI is considered a long-term capital investment that is irreversible in a short run, foreign investors are more cautious to their location choice. When host market successfully obtained numbers of large establishment from foreign investors, this is usually considered by potential investors as the signal of a sound investment environment. To them, such establishment could also be associated with a number of positive externalities in the host country such as technology spillovers, advanced labor skills and efficient production and supplier network and thus lead to further FDI inflows through a positive feedback channel. In line with recent empirical findings in support of the agglomeration effect in the U.S. (Wheeler and Mody, 1992) and Japanese FDI (Head, Ries, and Swenson 1995), this study indicates that the same effect also exists in transition economies. And this partly explains why the relatively advanced economies in the region,

which began FDI absorption much earlier than the others, continue to attract much larger share of FDI flows to the region.

Other variables mostly have the expected signs. With country size proxied by GDP level, its coefficient is consistently positive and strongly significant at the 1% level across all models. As the literature suggests that horizontal FDI are more attracted to host country with large market size, our result seems to be consistent with the early finding of dominant horizontal FDI among CEECs. The variable WFDI, which uses world FDI outflows to capture the supply-side effect on CEECs' FDI inflows, carries a positive sign and is significant among various specifications. It is in our belief that the inclusion of this global supply control factor avoids a possible upward bias in the estimation of the China effect.

Our results show that openness to trade is mainly positive and strongly correlated with FDI inflows. Since the variable is known as an indicator of a liberal trade environment in host country, its positive estimate implies that fewer regulatory restrictions and trade barriers tend to facilitate international trade and further induce FDI flows. One thing to note is that, although our results support a significantly positive correlation, the coefficient is only of limited absolute magnitude with some estimates turning even negative. In fact, in empirical literature on FDI, a negative impact of openness to trade on FDI has also been observed in various studies. One possible explanation, as pointed in Hausmann and Fernandez (2000), goes that openness to trade correlates with the degree of sophistication of the host financial system which in turn might be negatively correlated with FDI. The small absolute magnitude of the coefficient may come as a result of that.

Manufacturing wage rate, a proxy for labor costs, carries a negative but mostly insignificant sign. A strong negative coefficient on wage rates would imply a dominance of vertical FDI in host market. However, as suggested from previous analysis, FDI in CEECs are predominantly of horizontal type with a focus of market penetrating. As a result, labor costs are more likely to be downplayed by foreign investors who are mainly interested in accessing larger market and seeking efficiency. To them, labor quality in the host market, a critical factor of operational productivity and efficiency, is of much higher relevance. In line with the reasoning, our labor quality variable as proxied by illiteracy rate is found to be negative and significant. Thus, low level of skilled labor as indicated by a higher illiteracy rate tends to deter FDI inflows, reflecting the importance of labor quality in determining CEECs FDI inflows.

In the literature, tariffs are often considered an integral part of trade costs which are found to have a significant impact on FDI flows. However, on an aggregate level, their sign becomes ambiguous due to the different effect a horizontal or vertical FDI would bring. Specifically, they tend to attract horizontal FDI for domestic market penetrating purpose, but repel vertical FDI due to cost concerns. Thus, the sign would depend on which kind of FDI is dominant in the particular host country. Our results show a consistently positive though insignificant estimate, thus once again suggesting a dominant horizontal FDI among transition economies. Tax burden which is proxied by our inclusion of corporate income tax rate, even though keeping the right sign, seems to have only a marginal effect on FDI. One possible explanation, according to OECD study (2003), is that tax incentives may in certain cases be inefficient in promoting FDI. As they found out in their report, large MNCs usually are becoming more adept at relieving

their own tax burden through sophisticated tax planning well before the operation. As a result, those tax incentives offered by the host country often lose their appeal and are ignored. In the extreme, it may even run counterproductive as these tax policies are considered to be nontransparent, insecure or bureaucratically infeasible.

There is evidence that political and institutional stability of the host country can boost foreign investors' confidence in their investment. Our proxy of ICRG political stability risk index carries a positive sign across all models and is strongly significant under the fixed-effect model. This finding is consistent with the literature as the index assigns a higher score to those countries with political and financial stability, efficient institutional structure and strong law enforcement, all of which are conducive to FDI attraction.

Main telephone lines per thousand people as a proxy of host country's infrastructure quality, is statistically insignificant and seems to carry the wrong sign. A possible reason lies in the fading importance of traditional communication technique in face of current innovations. Our positive coefficient on the accession dummy indicates that the fifth EU enlargement does help new members in the region to attract more FDI. Admission of CEECs to the EU can be considered a worldwide recognition of the country's success in its political and economic reforms. As a result, foreign investors feel more comfortable investing in those markets with a favorable investment environment.

In general, we find in this paper no crowding out effect of China's FDI to the Central and Eastern European countries. In some cases, China's FDI seems even to help induce more FDI inflows to the region. Our results also show that among the

determinants, host country's market size, trade environment, as well as the labor quality all have strong influence on FDI inflows to CEECs.

5. Robustness checks

The GMM estimation procedure aims to correct for the potential endogeneity problem. To ensure the appropriateness of our model under GMM, we need to verify that there is no second-order serial correlation of first-differenced error terms and the instrument sets used in the estimation are properly specified. For this purpose, two tests are performed, namely, the Allerano & Bond second-order correlation (SOC) test and the Sargan test. The p-value from Table 5 for both SOC test (null of no correlation) and Sargan test (null of no instrument misspecification) indicate that neither of the null hypotheses can be rejected. Thus, the results confirm the properness of our interpretation under the GMM framework.

To further test the robustness of our model, we try to re-estimate by dropping individual country from our sample once at a time. It turns out that major conclusion remains effective. China FDI is not growing at the expanse of limiting potential FDI inflows to the Central and Eastern Europe. Market size, trade liberalization degree as well as labor quality remain significant in guiding FDI location decision among CEECs. In order to take a closer look at the impact of host country's political and institutional environment, we replace the ICRG index PSR with three separate indicators, namely, Corruption, Law and order, and Government stability. A higher score in each category corresponds to an above average quality of host market in that respect. Again, the results

are similar to the previous estimates with positive signs on each individual category. And our results for the China effect remain unchanged.

Additionally, in an attempt to control for the possible contagious effect of the financial crises in Asia in 1997 and later in Russia in 1998 on CEECs, we add a dummy variable, crisis, into the model with 1 for both year 1997 and 1998 and 0 otherwise. The result looks compelling. With a significant and negative coefficient, it suggests that the two consecutive financial crises, by severely hurting the global banking system and capital markets, lessened foreign investors' willingness and capability to invest in CEECs. However, inclusion of the dummy does not change our findings regarding the China effect.

6. Conclusion

China's emergence as a top recipient of FDI in the world follows its implementation of its open door policy and market economy reform over the last three decades. The successful transition experience of many Central and Eastern European countries also enables them to attract an increasing share of foreign investment from the world, particularly from the European Union. At the same time, results from existing studies strongly suggest that FDI going to emerging economies often serves to facilitate the operation of production networks. Given these different but related global trends, what is the relationship between FDI going to China and FDI going to CEECs? We hypothesize that there can be three possible relationships: China and CEECs are in different distinct regional production network, implying that the impact of China on FDI going to CEECs being zero; alternatively, China and CEECs are jointly in a global supply chain so that

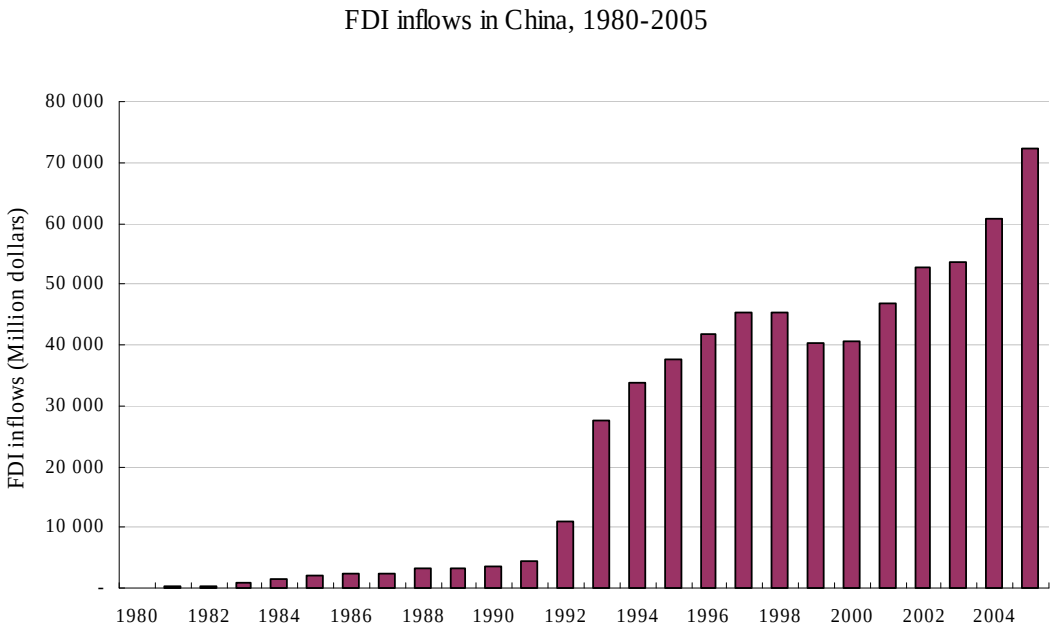
FDI going to China and that going to CEECs are positively related; lastly, MNCs may view China and CEECs as being rival production sites so that the China effect on FDI going to CEECs is negative.

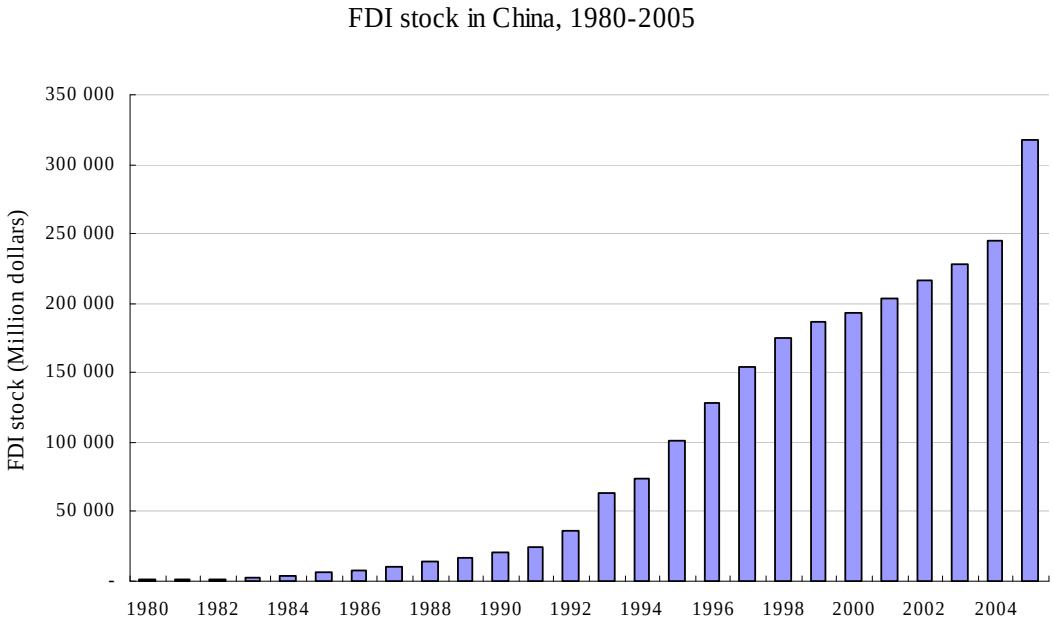
Despite the significant academic and policy implications, the question we pose here remains unresolved due to a lack of related empirical work. In this paper, we employ a panel data to study the so called China effect in detail. Specifically, we compare the empirical estimates on 15 Central and Eastern European countries over a 15-year period from 1990-2004 with four different econometric approaches: FGLS with Random effects, FGLS with fixed effects, EC2SLS, and GMM. The central empirical results we discover is that generally the China effect variable is insignificant. When the variable is significant, the sign of the coefficient is positive. The result supports the general conclusion that there is only a weak relationship between FDI going to China and FDI going to CEECs. With some regressions, FDI going to China and FDI going to CEECs are positively and significantly related. In other words, much of our empirical work supports the idea that China and the CEECs are in distinct regional production networks, with some limited evidence showing that China and CEECs may be in a global supply chain.

It can be argued that with certain Central and Eastern European countries maintaining a relatively high-skilled labor force and China one of the world's largest markets with relatively low cost labor, large MNCs may choose to fragment their production processes into both locations in order to better accommodate the local demand and their increasingly sophisticated global supply chains. To this extent, our results might be considered another support for the claim that China and the Central and Eastern

European countries, by undergoing the market economy transition through different approaches, are becoming integral to the global production network. It can also be mentioned that FDI into the CEECs has been more dominated by service sector investments than FDI into China, which is of course another indication of the different strategies chosen by the MNCs in these markets. Meanwhile, our analysis confirms the predominance of the host country‘s characteristics such as market size, degree of trade liberalization and labor quality as well as a global-wise healthy capital market in promoting FDI flows. We think that these findings provide some helpful policy implications to the Central and Eastern European countries on becoming attractive FDI destinations. However, much more research needs to be done on this issue in the future.

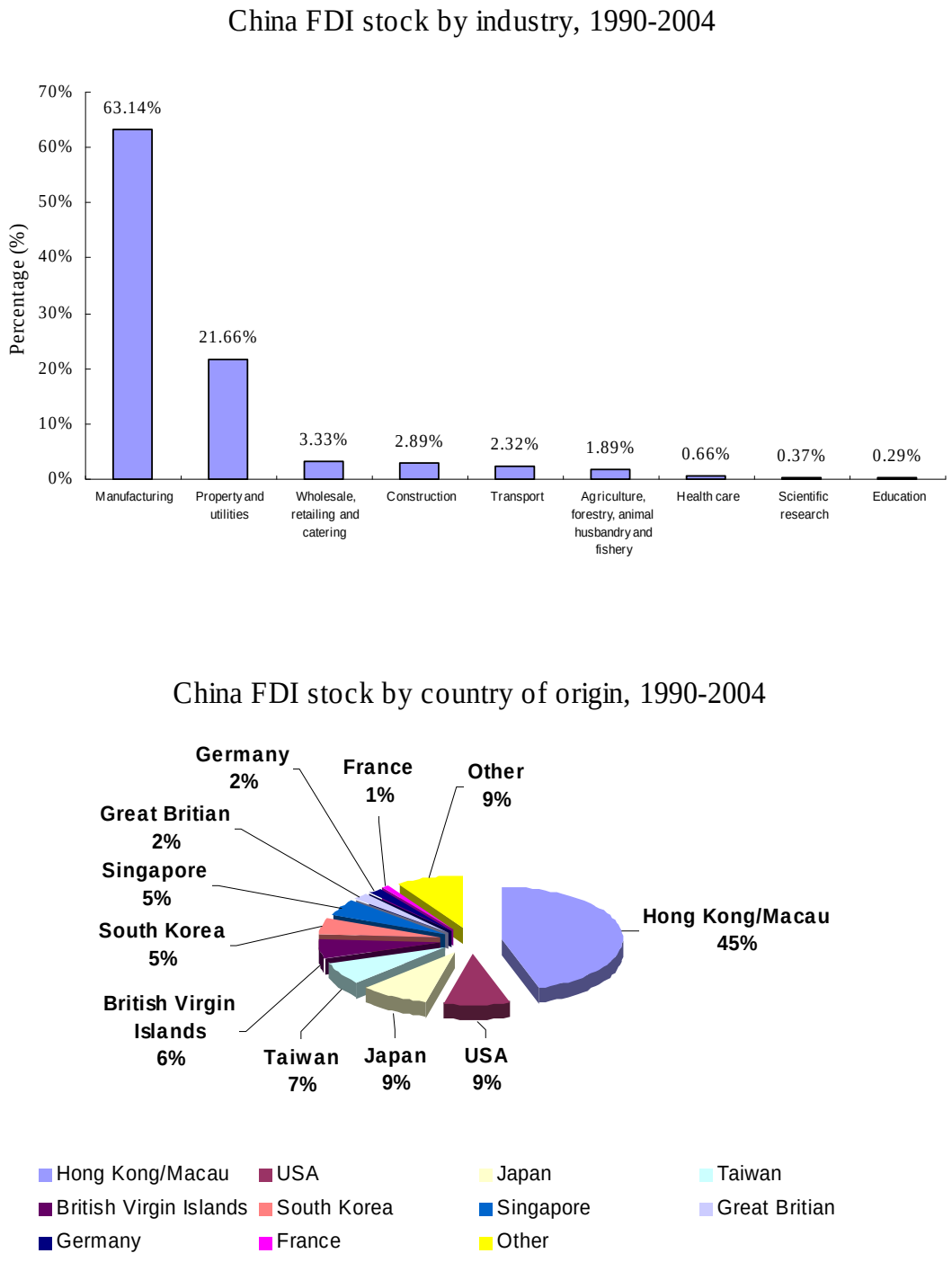
Figure 1: FDI inflows and FDI stock in China, 1980-2005





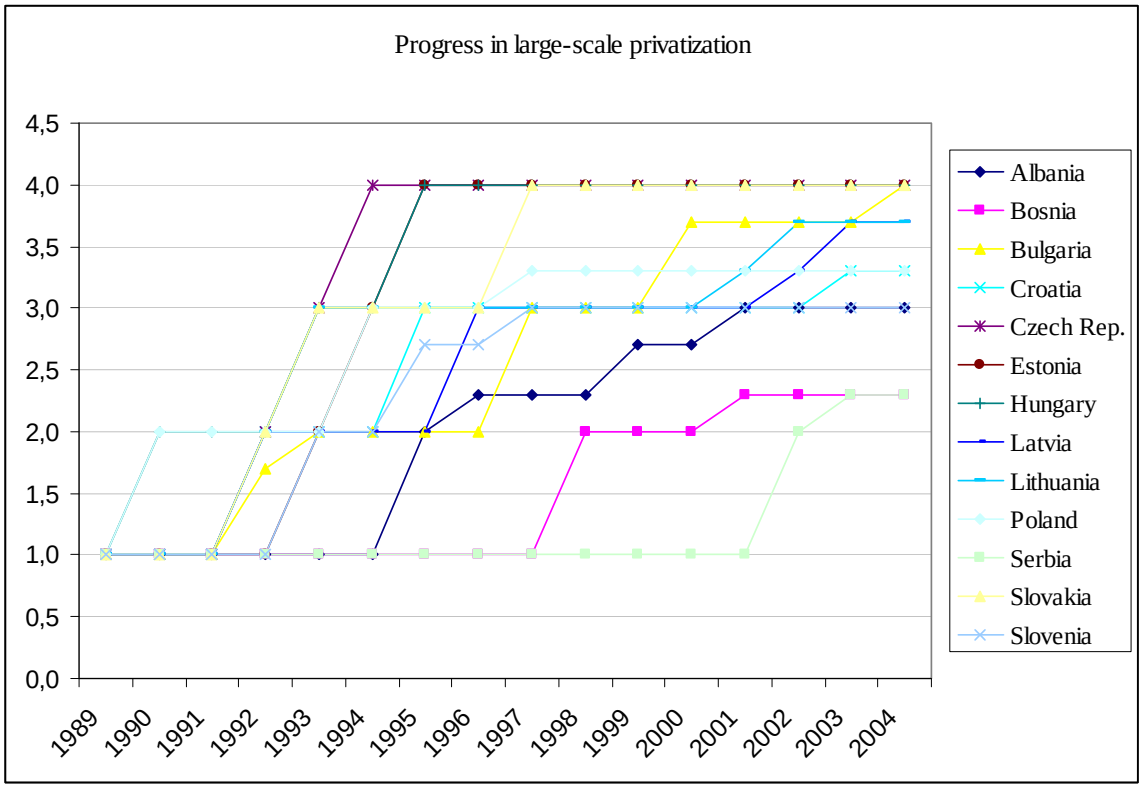
Source: UNCTAD World Investment Report online database.

Figure 2: Distribution of China FDI stock by industry and country of origin, 1990-2004



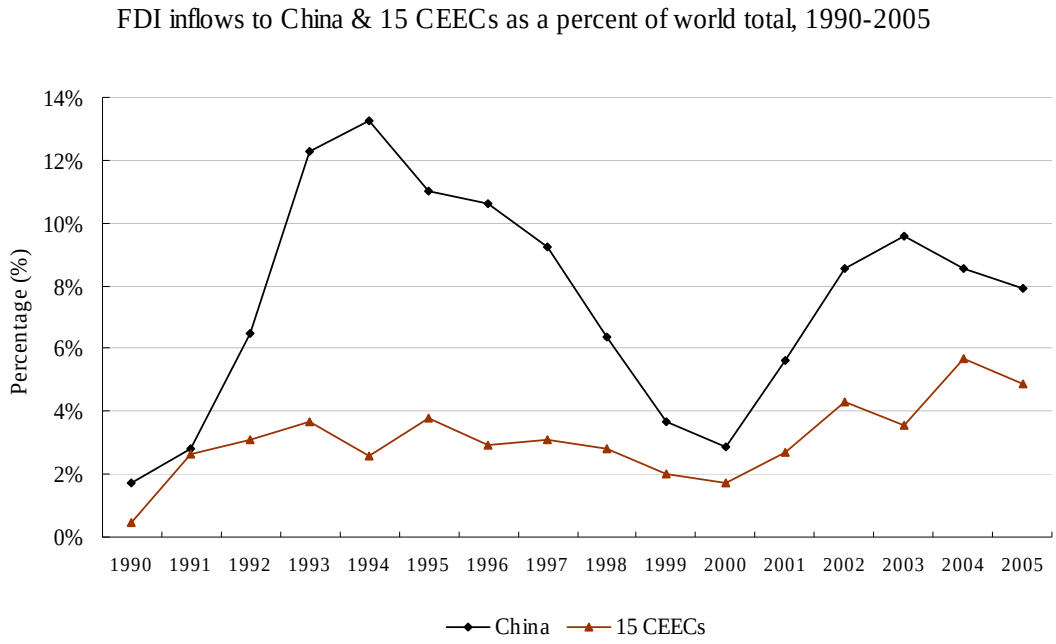
Source: National Bureau of Statistics of China, 2005.

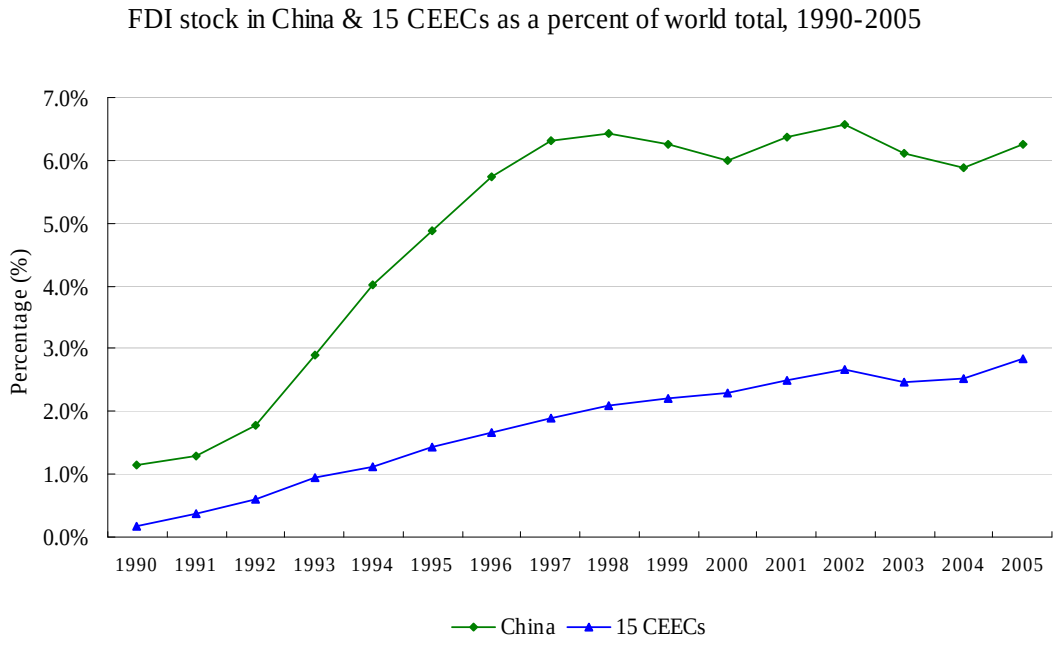
Figure 3: EBRD indicator of progress in large-scale privatization



Source: EBRD, 2007.

Figure 4: FDI inflows/stock to China and 15 CEECs as a percent of world's total, 1990-2005





Source: UNCTAD World Investment Report online database and authors' own calculation.

Table 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI†	202	1130	1850	0.01	12600
CFDI†	225	34900	16000	3490	54900
GPCGR	211	2.346	9.967	-31.34	86.35
GDP†	218	27100	37000	1120	192000
WFDI†	225	537000	319000	188000	1240000
WAGE	161	295.833	206.572	32.72	1174.9
INCTAX	126	29.892	8.219	5	45
TARIFF	139	4.141	3.781	0	18.57
OPEN	211	96.803	32.765	34.82	180.36
ILLIT	170	2.711	4.905	0.2	23.04
PSR	155	70.229	10.713	26	87
TELE	220	238.424	99.738	12.16	424.91

†: in millions

Table 2: Dependent variable: Inflow FDI (Fixed-effect)

	1	II	III	IV	V	VI
CFDI	-0.090	0.308**	1.081***	0.607	1.190***	0.672
	(0.363)	(0.157)	(0.312)	(0.726)	(0.306)	(0.773)
FDI_{t-1}	0.528***	0.153***	0.158**	-0.028	0.150**	-0.003
	(0.049)	(0.039)	(0.064)	(0.165)	(0.062)	(0.170)
GPCGR	-0.036	-0.017	-0.041**	-0.031	-0.045**	-0.034
	(0.033)	(0.013)	(0.019)	(0.032)	(0.018)	(0.034)
GDP		2.017**	5.786***	4.608*	6.176***	4.931*
		(0.927)	(1.557)	(2.602)	(1.518)	(2.649)
WFDI	0.797***	0.588***	0.533***	0.326	0.701***	0.354
	(0.299)	(0.129)	(0.158)	(0.262)	(0.173)	(0.314)
WAGE	-0.275	0.355	-0.971*	-2.612***	-1.277**	-2.600***
	(0.458)	(0.274)	(0.560)	(0.963)	(0.553)	(0.978)
ILLIT		-0.465**	-0.378*	-3.483***	-0.577**	-3.271***
		(0.198)	(0.228)	(1.125)	(0.256)	(1.180)
OPEN	-0.009	-0.003	-0.005	-0.020*	-0.004	-0.019
	(0.008)	(0.003)	(0.006)	(0.012)	(0.006)	(0.013)
TARIFF				0.050		0.039
				(0.072)		(0.078)
INCTAX				-0.017		-0.015
				(0.020)		(0.021)
PSR			0.040**	0.070***	0.036**	0.062**
			(0.018)	(0.027)	(0.018)	(0.029)
TELE					-0.808*	-0.107
					(0.459)	(0.834)
CRISIS		-0.082*	-0.156**	0.087	-0.131*	0.063
		(0.048)	(0.076)	(0.142)	(0.080)	(0.147)
ACCESS		0.418***	0.560***	0.823***	0.611***	0.771**
		(0.147)	(0.189)	(0.299)	(0.187)	(0.309)
Obs.	157	132	101	62	99	61
R-squared	0.707	0.792	0.807	0.802	0.803	0.794

Notes:
(1). Standard errors are reported in parentheses. ***, ** and * indicate coefficient significant at 1, 5 and 10%, respectively.

Table 3: Dependent variable: Inflow FDI (Random-effect)

	1	II	III	IV	V	VI
CFDI	-0.420	0.200	0.095	0.387	0.114	0.395
	(0.347)	(0.174)	(0.221)	(0.499)	(0.230)	(0.523)
FDI_{t-1}	0.649***	0.235***	0.378***	0.373***	0.370***	0.391***
	(0.038)	(0.037)	(0.059)	(0.129)	(0.061)	(0.133)
GPCGR	-0.053*	-0.006	-0.005	-0.031	-0.006	-0.034
	(0.031)	(0.016)	(0.019)	(0.032)	(0.019)	(0.034)
GDP		0.792***	0.775***	0.936***	0.718***	0.849***
		(0.102)	(0.124)	(0.217)	(0.132)	(0.232)
WFDI	0.404	0.571***	0.259	0.073	0.342*	0.121
	(0.281)	(0.147)	(0.173)	(0.244)	(0.191)	(0.276)
WAGE	0.195	-0.041	0.092	-0.130	0.141	-0.095
	(0.202)	(0.116)	(0.148)	(0.172)	(0.162)	(0.195)
ILLIT		-0.022	0.009	-0.886**	-0.029	-0.891**
		(0.027)	(0.028)	(0.345)	(0.044)	(0.359)
OPEN	-0.005	0.004	0.009***	0.013***	0.010***	0.013**
	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)
TARIFF				0.027		0.024
				(0.048)		(0.049)
INCTAX				-0.021		-0.020
				(0.017)		(0.018)
PSR			0.014	0.034	0.006	0.025
			(0.017)	(0.021)	(0.018)	(0.023)
TELE					-0.321	-0.182
					(0.308)	(0.457)
CRISIS		0.001	-0.010	-0.110**	-0.023	-0.117**
		(0.016)	(0.018)	(0.044)	(0.021)	(0.047)
ACCESS		0.263	0.285	0.276	0.260	0.260
		(0.172)	(0.197)	(0.224)	(0.200)	(0.226)
Obs.	157	132	101	62	99	61
R-squared	0.672	0.669	0.625	0.587	0.619	0.583

Notes:
(1). Standard errors are reported in parentheses. ***, ** and * indicate coefficient significant at 1, 5 and 10%, respectively.

Table 4: Dependent variable: Inflow FDI (EC2SLS)

	1	II	III	IV	V	VI
CFDI	-0.457	0.174	0.023	0.280	0.070	0.301
	(0.357)	(0.179)	(0.231)	(0.496)	(0.239)	(0.527)
FDI_{t-1}	0.651***	0.241***	0.392***	0.408***	0.380***	0.404***
	(0.039)	(0.039)	(0.062)	(0.132)	(0.064)	(0.136)
GPCGR	-0.052	-0.007	-0.006	-0.034	-0.008	-0.035
	(0.032)	(0.016)	(0.020)	(0.032)	(0.020)	(0.034)
GDP		0.770***	0.749***	0.881***	0.727***	0.880***
		(0.110)	(0.136)	(0.234)	(0.139)	(0.237)
WFDI	0.363	0.556***	0.269	0.038	0.335*	0.057
	(0.288)	(0.151)	(0.177)	(0.242)	(0.194)	(0.283)
WAGE	0.125	-0.041	0.085	-0.114	0.133	-0.101
	(0.215)	(0.121)	(0.156)	(0.170)	(0.166)	(0.197)
ILLIT		-0.026	0.009	-0.891***	-0.021	-0.903**
		(0.028)	(0.029)	(0.343)	(0.046)	(0.357)
OPEN	-0.005	0.004	0.009**	0.014***	-0.010**	0.014***
	(0.04)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
TARIFF				0.015		0.015
				(0.048)		(0.049)
INCTAX				-0.015		-0.016
				(0.017)		(0.018)
PSR			0.008	0.025	0.005	0.025
			(0.018)	(0.022)	(0.019)	(0.023)
TELE					-0.272	-0.065
					(0.329)	(0.097)
CRISIS		-0.003	-0.019	-0.122***	-0.026	-0.124***
		(0.017)	(0.019)	(0.044)	(0.021)	(0.047)
ACCESS		0.299*	0.301	0.276	0.283	0.274
		(0.177)	(0.202)	(0.222)	(0.204)	(0.224)
Obs.	147	123	93	59	93	59
R-squared	0.706	0.782	0.804	0.806	0.806	0.806

Notes:
(1). Standard errors are reported in parentheses. ***, ** and * indicate coefficient significant at 1, 5 and 10%, respectively.

Table 5: Dependent variable: Inflow FDI (GMM)

	1	II	III	IV	V	VI
CFDI	-0.268	-0.245	-0.213	-0.159	-0.211	-0.138
	(0.274)	(0.153)	(0.186)	(0.294)	(0.188)	(0.297)
FDI_{t-1}	0.647***	0.306***	0.446***	0.403***	0.441***	0.426***
	(0.038)	(0.036)	(0.153)	(0.128)	(0.054)	(0.130)
GPCGR	-0.066***	0.012	0.012	-0.026	0.011	-0.025
	(0.025)	(0.016)	(0.018)	(0.032)	(0.018)	(0.034)
GDP		0.541***	0.623***	0.883***	0.555***	0.799***
		(0.092)	(0.104)	(0.215)	(0.115)	(0.230)
WFDI	0.497**	0.270*	0.060	-0.036	0.121	-0.018
	(0.248)	(0.140)	(0.156)	(0.232)	(0.170)	(0.253)
WAGE	0.206	-0.050	0.137	-0.101	0.154	-0.100
	(0.201)	(0.124)	(0.151)	(0.172)	(0.166)	(0.196)
ILLIT		-0.034	0.003	-0.781**	-0.021	-0.767**
		(0.028)	(0.028)	(0.339)	(0.145)	(0.346)
OPEN	-0.005	0.001	0.008**	0.012***	0.008**	0.012**
	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)
TARIFF				-0.003		0.001
				(0.043)		(0.045)
INCTAX				-0.023		-0.020
				(0.017)		(0.018)
PSR			0.012	0.032	0.005	0.024
			(0.018)	(0.021)	(0.019)	(0.023)
TELE					-0.189	-0.025
					(0.310)	(0.442)
CRISIS		0.024	-0.005	-0.101**	-0.015	-0.104**
		(0.016)	(0.018)	(0.044)	(0.021)	(0.046)
ACCESS		0.310*	0.330*	0.329	0.311	0.307
		(0.184)	(0.202)	(0.222)	(0.204)	(0.224)
Obs.	157	132	101	62	99	61
Sargan test	0.040	0.483	0.480	0.473	0.480	0.473
SOC test	0.472	0.387	0.660	0.097	0.541	0.095

Notes:
(1). Standard errors are reported in parentheses. ***, ** and * indicate coefficient significant at 1, 5 and 10%, respectively.
(2). Sargan test (p-value): null hypothesis is no misspecification with instrument sets.
(3). SOC test (p-value): null hypothesis of no second-order correlation in differenced errors.

Appendix: Data Descriptions and Sources

Variable	Definition	Source
FDI†	FDI inflows (constant 2000 USD in million)	UNCTAD World Investment Report online database
CFDI†	China FDI inflows (constant 2000 USD in million)	UNCTAD World Investment Report online database
FDI_{t-1}†	One year lagged FDI inflows	UNCTAD World Investment Report online database
GPCGR	Growth rate of real GDP per capita (%)	World Development Indicator online database
GDP†	Annual real GDP (USD in million)	World Development Indicator online database
WFDI†	World FDI outflows (constant 2000 USD in million)	UNCTAD World Investment Report online database
WAGE†	Wage rate in manufacturing sector in US$, converted by official average exchange rates from local currencies	self calculation with International Labor Organization's LABORSTA and WDI data
INCTAX	Corporate income tax rate (%)	PWC *Worldwide Tax Summaries* and *European Tax Handbook*
TARIFF	Taxes on international trade (% of total revenue)	IMF Government Finance Statistics Yearbook and various national statistic agencies
OPEN	Ratio of country's trade turnover to its GDP (%)	self calculation with WDI data
ILLIT	Percentage of people aged 15 and above who are illiterate (%)	UNESCO Institute for Statistics
PSR	Political stability risk index	ICRG Group
TELE†	Number of telephone mainlines per 1000 people	World Development Indicator online database

†: variables transformed into logs.

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